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Selecting a Small Business Computer System in Alberta

Number Seven of a Series

Alberta

TOURISM AND
SMALL BUSINESS

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Selecting a Small Business Computer System in Alberta

PREFACE

The use of computer systems has increased dramatically since their general acceptance by the business community in the late 1950s. Computers are now a part of our daily lives - we are exposed to them when making an airline reservation, checking a bank statement or paying our taxes. The widespread use of computer-produced invoices, cheques, inventory listings or financial reports bears witness to the rapidly increasing use of computers by organizations of many types and sizes.

The use of computers is expected to increase in coming years as costs continue to decrease and as the development of new technologies makes computers easier to install and use. The development of minicomputers in the last decade and microcomputers in recent years, has been instrumental in expanding the use of computer systems. They are now an affordable alternative for many small businesses.

The decision to use computers is an important one and should not be taken lightly. In many instances, a computer system controls and reports on such key aspects of a business as financial accounting, inventories and sales statistics. Therefore, it is necessary to step back and carefully evaluate the advantages and pitfalls of business automation before deciding to install a computer.

The purpose of this booklet is to provide an appreciation of computer systems in the small business environment. The initial chapters consider the type of business situations that may benefit from automation and whether or not implementation would be advantageous. This is followed by an examination of alternative computer systems and services available to small businesses and suggestions on how to select and install a computer system.

The present day computer is much simpler to operate than its predecessors. Even so, it is useful to understand the purpose and limitations of a typical modern computer. An Appendix to this handbook is devoted to a more detailed description of computers than is found in the following chapters. The computer industry uses a variety of technical jargon and terms. Technical terms, which are printed in bold face throughout the text, are explained in the Glossary of Terms at the end of this booklet.

Alberta Tourism and Small Business trusts this booklet will be a useful guide to selecting a computer system. The subject is an important one and is likely to be faced in the near future by small businesses in most sectors of industry be they retail, manufacturing or service. As with all important business decisions, it cannot be emphasized enough that sound planning and good control are necessary for the successful use of computer systems within any organization.

"Selecting a Small Business Computer System in Alberta" is one of a series of booklets published by Tourism and Small Business. Other booklets that may be useful are:

- Starting a Business in Alberta
- Financing a Business in Alberta
- Marketing for a Small Business in Alberta
- Operating a Small Retail Business in Alberta
- Operating a Small Manufacturing Business in Alberta
- Operating a Small Service Business in Alberta
- Bookkeeping for a Small Business in Alberta
- Operating a Small Construction Business in Alberta.

These publications are available at all Tourism and Small Business offices listed in the back of this publication.

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Chapter One

An Introduction to Computers

Computers are relatively new to the small business environment. Until a few years ago, computer use was primarily confined to large corporations and government organizations. Recent advances in electronic technology have caused significant decreases in the cost and the physical size of computers; computer costs have dropped below the $10,000 threshold while computer sizes have been reduced to the dimensions of a typewriter. Other developments have made computers easier to use.

Today, costs have reached the point where computer systems are economically viable for many small businesses. The next few years are expected to show explosive growth in demand for this type of equipment from the small business sector.

While computers continue to be highly sophisticated, prospective users do not require a detailed technical knowledge of how computers work. However, a general knowledge of the main elements of a computer and how it processes data are still valuable for potential computer users.

BASIC FEATURES

A computer system consists of several basic elements which operate in unison to process data in an organized manner. **Hardware** is the collective term which refers to the physical components or machinery of the computer system. The hardware is **programmed** to operate by following a set of symbolic instructions; these computer instructions are called **software**. A computer system is incomplete without the **manual procedures** by which people direct and manage the computer to perform useful work.

Regardless of the size or complexity of any computer, all have pieces of equipment which are responsible for specific tasks. The **central processing unit** is the 'brain' of the computer. It contains a **processor** which performs arithmetic and logic operations on data.

The **memory** of the processing unit retains the data and instructions for the processor. Since the memory is generally too small to contain all the data and instructions required for a particular job, most computers are equipped with an **auxiliary memory** or storage devices. Storage devices such as magnetic **disks** or **tapes** can retain large volumes of data or instructions.

Data may be entered into the computer using **input devices**, such as the keyboard of an automatic bank teller machine. Processed data may be communicated to users through **output devices**, such as printers or visual display terminals. The pieces of equipment used for storage, input and output, are **peripheral** devices of the central processing unit.

Software is the general term that applies to the instructions used by computers. A set of instructions designed to perform a single task is generally called a **program.** One or more programs may be organized to perform a major job. Thus, a 'General Ledger System' may be composed of several programs which, together, perform the tasks necessary to maintain the financial records of a business.

Several types of software are used by a computer system. **Applications software** refers to programs which instruct the computer to do useful functions such as maintain customer lists, analyze inventory levels and prepare invoices and statements. **Utility** software refers to programs which help to maintain the computer system in good order. Some utility programs are used to assist in the development of other programs; these include **text editors** and **language compilers.** Other utilities are used to manage data, such as file copy programs, **data base** programs and data **back-up/restore** programs. **System software** or **operating system** refer to programs which manage the computer internally. These complex programs perform such tasks as loading and starting applications programs, organizing data and program **files** on disks, and accepting and interpreting commands from users.

As with any other machine, a computer system must include operating procedures to be effective in performing its function. The

procedures are the steps by which people operate, maintain and control the computer system. Sound procedures, supported by good documentation and training, are critical to the success of a computer system in any enterprise.

CHARACTERISTICS OF COMPUTERS

The notable feature of computers is the ability to do things fast - arithmetic and logic operations are performed in one-millionth of a second (a microsecond); data records are stored or retrieved in thousandths of a second (milliseconds). Like most machines, computers can perform operations repeatedly - printing cheques, revising inventory records or calculating costs are tasks that computers perform over and over. Unlike many machines, computers are versatile. With a simple change of software programs, a computer can be made to calculate a payroll or prepare a mailing list or financial forecasts.

Of course, computers have limitations. Computer instructions, in the form of software programs, must be precise and accurate otherwise the computer will not operate properly. Similarly, data must be correctly presented to the computer. The adage, "Garbage in equals garbage out", expresses the effect of providing erroneous data to a computer. Although most computers have self-checking features, they are nonetheless machines and their mechanical and electronic parts will fail. Maintenance of computers requires the services of skilled technicians.

TYPES OF COMPUTERS

Computers are available in many forms and sizes. Most computers are designed for general applications and accordingly are called general-purpose computers. Others are designed for specific purposes, for example word processing. The sizes and prices of computers vary considerably, from hand-held computers costing approximately $100 to very large computers which require large special purpose computer rooms and cost several millions of dollars. These large computers or **mainframes** are used by governments, large corporations, universities and **computer service bureaus.** Intermediate size computers are called **microcomputers** and **minicomputers.** The distinctions between these machines originally included their price, processing power, data storage capacity and physical size. However, recent technological advances have blurred these distinctions; for example, microcomputers of today have the processing power and data storage capacity of some five-year-old minicomputers. These technological advances have resulted in significant price decreases.

USES OF COMPUTER SYSTEMS

Computer systems are applied to a wide variety of human endeavors. The most common computer application is the business data processing of such functions as accounting, inventory control, order management and sales analysis. The scientific and engineering communities make extensive use of computers for mathematical computations such as statistical analysis, materials stress analysis and mathematical modelling. Computers are increasingly being applied within industrial processes for such applications as machine control, product assembly and product testing. An 'information industry' is emerging to provide subscribers with instant access to information on a wide variety of topics — case law for lawyers, stock market quotations and global weather conditions are but a few data bases resident in computers. Many consumer products including automobiles, sewing machines, cameras and microwave ovens have computers incorporated in their design. This publication was prepared using computers: **word processors** for preparing the text and **photocomposition** facilities for producing the camera copy. In fact, computers can be applied to any function where data are gathered, processed and provided in the form of information or automated actions.

The following chapter discusses the use of computer systems in more detail and outlines some of the most common functions handled by computers within the business environment.

Chapter Two

When Should Computer Systems Be Used?

QUESTIONS FOR MANAGEMENT

Many business people do not know when computers could benefit their organization. This chapter presents some clues which could indicate when a computer may be advantageous. Examples of the type of work that is commonly performed by a computer are provided.

At the outset, it must be stressed that a computer solution is not normally the total answer or the only alternative to be considered. It is simply a tool to aid in solving business problems and must be thought of only in that light. With this in mind, some typical indicators of potential benefits of a computer are:

- Accounting conditions
  - Delays occur in invoice preparation and goods are shipped without invoices.
  - Control on outstanding accounts receivable is weak and too many accounts are written off as bad debts.
  - Accounts payable are not organized, resulting in missed opportunities for early payment discounts and late payment penalties.
  - Opportunities for tax reduction are missed because of weak fixed assets accounting controls.
- Customer services
  - Customer orders are delayed because of excessive paperwork.
  - Information on outstanding customer orders is not readily available and customers become dissatisfied.
- Inventory conditions
  - Inventory shortages occur frequently.
  - Too many expensive, slow-moving items are carried.
  - Inventory records cannot be easily reconciled against sales and receipts records.
- Personnel Conditions
  - Expenses for clerical overtime are excessive.
  - The turnover rate of clerical staff is high, resulting in lost time for recruitment and staff training.
- Production conditions
  - Product pricing methods cannot react quickly to frequent changes in component costs.
  - Frequent changes in labor requirements occur as a result of inadequate scheduling.
- Management information conditions
  - Up-to-date financial information is not readily available.
  - Profit margins on individual product lines or projects cannot be easily determined.

It must be emphasized that experiencing some or any of the above situations is no guarantee that computer systems will be the prime solution. Improved manual methods, reorganization of a business or improved management techniques may be alternative solutions to business problems.

BENEFITS

The correct use of computer systems can provide real returns to an organization. Some of the more general benefits are:

- **Stabilized labor and overhead costs:** Computer operating costs have remained relatively constant and are expected to continue to do so in comparison with labor and allied costs. With a well-managed computer system, there can be a lower requirement for increases in administrative staff as the business grows.
- **Accelerated cash collections:** A computerized order management and accounts receivable facility can help a business distinguish good credit customers from weak ones; issue invoices and statements on time and provide more time for management to attend to bad accounts.
- **Reduction and control of inventories:** computerized inventory system can assist management in distinguishing fast-moving items from slow ones, identifying obsolete items and improving reorder procedures.
- **Better customer services:** computerized order management and inventory system can improve customer relations by providing up-to-date order status information, accurate pricing and improved control on product delivery.
- **Accuracy in accounting:** A computerized accounting system can improve the accuracy of accounting data through reduction of transcription errors and accurate calculations of extensions and summaries.
- **Timeliness in reporting:** A computerized business system can provide up-to-date financial, inventory, sales, work-in-progress or other analytic reports, so that management can react quickly to changing business conditions.
- **Improved forecasting and estimating:** With more up-to-date and accurate information, management can identify trends and improve forecasting techniques. Business models can be used to answer such questions as, "What if interest rates go up by three points?" and "What is my product cost if the minimum wage increases by ten per cent?"

Such benefits are realistically obtainable through the well-planned and controlled use of computers. Significant benefits may be achieved when computers are applied to business operating functions (e.g., production scheduling, materials requirements planning, job estimating and business forecasting). Marginal benefits may be obtained in such administrative functions as general accounting and payroll.

In fact, there are a wide variety of potential uses that small businesses could consider for automation.

Typical Small Business Computer Applications

Type of Business	Computer Application	Major Functions
All Businesses	General Ledger	Maintains general ledger accounts. Prepares financial statements.
	Accounts Payable	Maintains payables ledgers. Prepares cheques and cash requirements reports.
	Accounts Receivable	Maintains receivables ledgers. Prepares statements and aged receivables reports.
	Fixed Assets	Maintains fixed assets ledgers. Calculates depreciation and book value.
	Payroll	Maintains payroll ledger and employee records. Prepares paycheques and associated payroll reports.
	Electronic Spreadsheet	Prepares and analyzes business models for such activities as budgeting, financial and strategic planning, forecasting, manpower and salary planning.
	Word Processing	Assists in the composition of documents such as letters, reports, proposals and quotations.
	Data Base	Assists in the maintenance and retrieval of information such as customer contacts and equipment lists.
Retailers, Wholesalers	Order Entry and Sales Order Management	Prepares order acknowledgements, and Manufacturers Sales Order picking and shipping lists. Controls outstanding orders.
	Inventory Control	Manages stock receipts, issues and counts. Identifies items for reorder. Prepares inventory valuation reports.
	Purchasing	Prepares and tracks purchase orders.
	Invoicing	Prepares customer invoices.
	Sales Analysis	Prepares sales reports by product, outlet, salesperson, customer, etc.
Manufacturers and Custom Fabricators	Work Order Control with job scheduling	Controls outstanding work and work-in-progress. Reports status and valuation of jobs.
	Bill of Materials Requirement Planning	Maintains records of materials, labor and equipment requirements by product. Maintains standard costs of products.

Type of Business	Computer Application	Major Functions
Construction	Job Estimating	Prepares job cost estimates. Maintains standard costs of materials, labor, machinery and burden.
	Job Costing	Applies actual costs of materials, labor, machinery and burden to jobs. Prepares work-in-progress reports.
Transportation	Bills of Lading Management Fleet Management	Prepares waybills. Tracks costs by unit. Prepares vehicle maintenance schedules.
Public Warehousing	Consigned Inventory Management	Maintains records of customer inventories, receipts and shipments. Prepares storage and service billings.
Hotels, Motels, Resorts	Hotel Management	Manages reservations and Resorts bookings. Tracks service charges and prepares invoices and statements.
Real Estate Developers	Property Management	Tracks rental income and expenses. Prepares reports such as rent rolls, vacancies, delinquencies and expiries.
Professional Services (engineers, accountants, lawyers, advertising agencies, etc.)	Client Portfolio Time Accounting	Maintains client records. Tracks fees and expenses and prepares work-in-progress reports.
Health Services (doctors, dentists, clinicians, etc.)	Medical Office Management	Maintains patient appointment schedules. Maintains fee schedules. Applies fees to services delivered and prepares claims or invoices. Prepares practice analysis reports.

Chapter Three

Determining Data Processing Needs

FEASIBILITY STUDY

Like most important decisions, the move to a computer requires that time be spent "up-front" in research and planning. Your involvement is important since no one knows as much about your business as you.

The key to determining whether a computer can be of benefit to your organization is a **feasibility** study. A feasibility study involves identifying where, why and how a computer may be effectively utilized. It consists of an overview to identify potential application areas and includes a definition of the business requirements for each area, consideration of alternative methods of satisfying the needs and an estimate of costs and benefits. A good feasibility study can help you avoid the mistake of applying a computer to areas of the business where little benefit can be realized or where alternative solutions may be more cost-effective.

Ideally, the needs of your whole organization should be considered rather than those of just one business area. The main elements of a feasibility study are:

- Identification of the strengths and weaknesses of your current operations with particular emphasis on bottlenecks, duplication of efforts and areas where information reporting is inadequate.
- Identification of the business areas which could be improved through automation.
- Identification of the information requirements of these areas, that is, who needs what information, where and when.
- Identification of planned or potential changes which may affect these business areas. Such changes as business growth, opening an additional office or starting a new product line may significantly affect a business area.
- Identification of alternative approaches to improving the weaknesses of the business. Such alternatives should include improved manual methods and use of third-party services (e.g., inventory services, collection agents or accounting services) as well as automation.
- Calculation of the costs of current procedures and estimation of the costs and savings for each alternative. These estimations should consider the quality and availability of needed input data for the alternatives. Intangible effects such as staff morale or customer satisfaction should also be identified for each alternative.
- Review of the results of the analysis highlighting those business areas where the greatest improvement can be made. Often an area with marginal opportunity for improvement can be significantly improved when combined with another related business area.

The findings of an analysis should be written; a summary often highlights the needs more clearly than a detailed report.

From this analysis, it should be possible to evaluate whether the business requirements appear suited to an automated solution or whether other changes, such as improvements to the existing manual system, will resolve business problems. If it appears that a computer system could be a viable alternative, the next stage is to consider what type of computer facility is best suited to your requirements.

An example showing a portion of a feasibility study for a small general contractor appears below.

Function: Job Estimating

1. Problem Areas:

- Current methods of estimating the costs of jobs are inaccurate and time-consuming.
- Bids are lost which could have been won if estimates were more accurate.
- Insufficient profit margins on some jobs result from low estimates.
- Actual job costs cannot be easily related to estimates in sufficient detail to benefit from previous mistakes.

2. Volumes:

- Job estimates for an average of 25 major bids per year are prepared.
- Each estimate involves over 500 breakdown detailed estimates.
- Each estimate requires more than 15 man-days to prepare.
- An average of three major contracts per year are won.

3. Current Operating Costs (Annual) For Estimating:

• Employee's time, including overtime	$26,000
• Owner's time, including overtime (equivalent)	30,000
• Secretary's time (10%)	1,500
Total:	$57,500

4. Requirements:

- Reduce time in preparing estimates.
- Reduce the arithmetic errors in calculations. (More time to check results.)
- Use more up-to-date costs for materials, labor and equipment allowances.

5. Benefits (annual):

Tangible

• Reduction in estimating time — no overtime salaries	$11,25
• Increased profit margin on three contracts by one-half per cent	7,500
• One additional winning contract, profit margin	37,500
Total tangible benefits:	$56,250

Intangible

- Better staff morale
- Improved family relations due to fewer evenings at work.

6. Alternatives:

- Spend more time on fewer job estimates.
- Contract to professional quantity surveyors.
- Employ a computerized job cost estimating system.

7. Conclusions:

- A computer system to assist in job estimating will speed up the process, improve calculating accuracy and prepare better estimates.

Chapter Four

Types of Computer Systems and Services

ADVANTAGES AND DISADVANTAGES

Basically, there are two methods of bringing computer systems to a company. Both are potentially suitable for small businesses. They are: acquiring a computer and installing it within the organization or using a computer service bureau. In some circumstances, a combination of an in-house computer system and the use of a service bureau may be most effective.

Having a purchased or leased computer is fast becoming a familiar sight for medium-to-small-size businesses. The main advantages of this type of processing are:

- **Flexibility of Schedules:** Work can be performed when desired.
- **Flexibility of Business Procedures:** A computer system can be adapted to fit unique business procedures.
- **Low Cost Expansion:** Provided that consideration was given to growth requirements before selecting a computer, it will normally offer the ability to increase processing volumes with marginal increases in cost.
- **Security of Data:** The data never leaves the premises. Therefore, if data are sensitive, total control of that data remains within the organization.

Some significant disadvantages to owning a computer are:

- **Capital Outlay:** Whether an in-house computer system is acquired by outright purchase or financial lease, the net effect is a reduction of capital which could otherwise be used for business opportunities.
- **Leasehold and Operating Overheads:** An in-house computer may require leasehold improvements (a separate room, air conditioning, electrical work, etc.) and will require some operating overheads such as computer maintenance, supplies, insurance and staff training.
- **Technical Obsolescence:** An in-house computer will eventually become obsolete and at that time, spare parts and qualified service technicians may not be readily available.

Service bureaus can provide an effective alternative to owning a computer. Some service bureaus operate large general-purpose computers and provide general business data processing services to a variety of clients. Other service bureaus are more specialized, offering one product to many industries (e.g., a payroll service bureau) or a complete business service to a specific industry (e.g. automobile dealers, travel agencies, insurance agencies).

All service bureaus provide general advantages:

- **Flexibility of Processing:** Large service bureaus have the processing capacity to meet peak demands of many clients. This is particularly significant for businesses which experience large, cyclic variations in business volumes or periods of high growth.
- **Fee for Service:** Most service bureaus charge on a 'pay as you go' basis, although some charge a subscription or minimum monthly fee. This feature can be attractive for business clients who require only occasional services or who have significant variations in business volumes.

As well, the specialized service bureaus can provide additional advantages:

- **In-Depth Knowledge:** Depending upon the service offered, these service bureaus can provide the specialized knowledge required for a specific industry or service product.

- **Economies of Scale:** Certain large data bases, such as airline schedules and rates used by travel agencies, can be economically justified only by large service bureaus which share costs of maintaining these data bases among many clients.

There are some disadvantages in the use of service bureaus:

- **Premium Prices:** The charges for some services may be relatively high when compared to an in-house computer, especially for those businesses which require daily services of constant volume.
- **Remote Operations:** Many service bureaus require that clients forward source documents or prepare coded forms for subsequent processing. Printed reports, together with the source or coded documents, are returned to the client. Such remote operations impose scheduling restrictions and time delays on a client's business.

There are opportunities for small businesses to take advantage of the best of in-house computers and service bureaus. Businesses could choose to use an in-house computer for day-to-day business data processing and a service bureau for specialized computing.

As an example, most small businesses realize a marginal return from an in-house payroll system due to the high costs of maintaining compliance with government taxation and reporting regulations. More significant returns can be realized when this task is contracted to a payroll service bureau.

IN-HOUSE COMPUTER APPROACH

There are several general sources from which a small business may acquire a computer system. These sources are differentiated by the types of products and services provided:

- Computer manufacturers design, manufacture, sell and service small business computers and system software. Many manufacturers also sell and support applications software. In some cases, manufacturers are represented by agents who sell and support their products.
- Third-party companies, called **original equipment manufacturers** (OEM), purchase computer components from manufacturers, develop applications software and sell the computer systems as **turn-key packages.** Some of these OEMs make up a package by combining hardware, systems software and applications software from several manufacturers. Such OEMs generally provide ongoing maintenance support for the complete package. Other OEMs, also called **value-added remarketers** or **system builders,** make up a package using hardware and systems software from one computer manufacturer together with applications software of their own design. In such cases, ongoing hardware maintenance is generally provided by the computer manufacturer and the software support is provided by the OEM.
- Third-party companies, called **software houses or systems houses,** develop, sell and support applications software packages. Many software houses, particularly the small companies, specialize in software for specific industries. Some software houses specialize in developing applications software which will operate with computers of only one manufacturer.
- A 'one-stop-shopping' approach to buying computer systems is provided by retail outlets -- computer stores, business equipment stores and department stores. These stores generally sell small computers, packaged software and supplies for business, home

and school use. The specialized stores may also provide maintenance services.

- Small business computers (particularly microcomputers) and applications software can be purchased by mail order. Generally, mail order companies provide limited or no after-sales support for the product.
- Used computer systems can be purchased from various sources -- brokers, used equipment dealers or directly from a previous owner. In most cases, the equipment is sold 'as is' and no ongoing support is provided by the seller.
- Smaller computer systems and computer peripherals may be rented from specialized rental companies. A rental approach may be advantageous for small businesses who have a short-term requirement for additional equipment.

The type of supplier chosen is often dictated by the requirements of the business and the resources within the business. For example, large businesses often purchase the hardware and system software directly from a computer manufacturer, acquire some applications programs from software houses and develop the remaining applications programs using their staff of **systems analysts** and **programmers.** Medium-sized businesses typically acquire computer systems from OEMs or a combination of an equipment manufacturer and a software house. Small businesses often acquire computer systems from retail stores or OEMs.

SERVICE BUREAU APPROACH

Service bureaus, like suppliers of in-house computer systems, offer a wide variety of computing services. (Some service bureaus even sell computer systems.) In general, there are four classes of service bureaus:

- General purpose service bureaus provide computing to a wide variety of clients. Most provide cross-industry applications software packages (e.g., general accounting) and several provide vertical industry software (e.g., manufacturing control). Some clients provide their own applications software and only employ the computing resources of the service bureau.
- Industry-specific service bureaus provide services to specific vertical industries. These service bureaus not only provide the computing resources but also applications software, consulting expertise and appropriate data bases to meet the specific needs of the industry to which they cater.
- Application-specific service bureaus provide services in a specific application area. In addition to the computer services and applications software, these service bureaus often provide consulting services in their specialized field. Many applications-specific service bureaus are ancillary services of professional organizations (e.g., engineering, accounting).
- Public data base service bureaus provide information services to clients. Many such service bureaus provide specialized information services -- the commodities market, medical index, legal information and even information on computer software. Other information service bureaus provide general information -- newspaper articles and book abstracts.

Most service bureaus charge on a fee-for-service basis. Because of the variety of methods that service bureaus use to calculate their fees, it is often difficult to compare rates among service bureaus. Nevertheless, sales representatives are willing to provide estimates for typical cases.

OTHER SERVICES

A variety of computer-related services are available to small businesses:

- Professional consultants can assist small businesses with such tasks as conducting feasibility studies, analyzing requirements, evaluating, selecting, installing and supporting computer systems.
- Education and training can be provided by community colleges, technical colleges, universities and commercial schools.
- Computer maintenance can be provided by professional maintenance companies.
- Computer communications services and equipment are available from public and private telecommunications companies.
- Special services, such as data entry, microfilm/microfiche production and graphics production are available from service companies.
- Computer supplies are available from retail stores, business forms suppliers and computer manufacturers.

The choices and considerations that face a small business are many and varied. The following chapters provide a step-by-step plan for selection, implementation and operation of a computer system in your business.

Chapter Five

Selecting the Right Computer System

Selecting the right computer system is very important. Computer applications can change such key elements of administration as accounting, financial reporting and business planning, so the selection process should be thorough. Be prepared to devote time to your deliberations. Do not be hurried into a decision.

You are making a decision on a very technical subject so if you feel uncomfortable it is wise to seek impartial advice. There are several organizations, such as consulting firms, that offer technical assistance with data processing. But, avoid leaving them to make the whole decision; they will never know your organization as well as you do.

To assist in the selection of a computer system, a six-step plan should be followed:

SELECTION PLAN

STEP 1 - ESTABLISH A PLAN

A plan should include:

- staff assigned to the project
- a work schedule which identifies the activities, assigned staff and completion dates and
- a budget for expenses (travel, consultant fees, etc.)

Ask for staff input at the early planning stages. Their input will provide valuable insights into the system's objectives. As well, they will feel like part of the process which may alleviate negative reactions or fears. When preparing a schedule, be sure to allow time for normal business activities. If the business is cyclic, the selection schedule should coincide with a slack period.

STEP 2 - DEFINE YOUR OBJECTIVES

From the feasibility study, identify which business functions will be automated. Identify anticipated time, money and human resource investments as well as anticipated returns.

Review the options for automation with due consideration to such factors as capital financing, business growth, cyclic business volumes, staff resources and the special nature of the business. From this review, select the approach which is most suitable.

Prepare a list of criteria which will be used to evaluate alternative computer systems. Some significant criteria are:

- compliance of applications systems with functional requirements
- capacity of hardware to handle business volumes (short term and long term)
- requirements for staff training
- availability of ongoing support and
- initial investment and ongoing costs

STEP 3 - PREPARE A 'REQUEST FOR PROPOSAL'

The objective of a request for proposal (RFP) is to provide prospective computer system suppliers with a clear statement of the requirements together with all the information they need to make the best proposal possible. The contents of a request for proposal should include:

Background: a brief statement on the nature and scope of the business.

Requirements: a list of the application systems requirements with brief functional descriptions, relevant business volumes and anticipated growths.

Response Guidelines: a description of the desired form and content of suppliers' proposals. These guidelines will vary, depending upon the type

of computer system selected in Step 2. Some key points which should be included are:

- for microcomputer systems and minicomputer systems:
  - specifications of each piece of equipment
  - equipment expansion capabilities
  - specifications of each software package
  - equipment maintenance plan(s)
  - software support plan(s)
  - training and installation assistance
  - installation requirements
  - costs and financing options for all proposed hardware, software, maintenance, support and training, including future hardware expansions
  - details of warrantees and formal agreements
- for minicomputers with custom software:
  - all points listed above plus
  - proposed approach and schedule for software development and implementation
  - costs for custom development - fixed price or variable rates
- for service bureaus:
  - terminal equipment requirements and specifications
  - specifications of proposed services including sample reports
  - support services, including training
  - details of service charges, including any minimum charges
  - estimates of service charges, including one-time charges (e.g., for set-ups) and ongoing charges
  - any other costs (e.g., forms, terminal maintenance)
  - details of contracts
- other information may be requested from suppliers:
  - background information on the supplier's company, including number of offices and support personnel in Alberta
  - a list of references who use the same type of system as proposed
  - samples of documentation

Terms and Conditions: general terms, including due date for response, guarantees of price quotations, and confidentiality.

STEP 4 - INVITE PROPOSALS FROM SELECTED VENDORS

Although there are a large number of computer system suppliers in Alberta, invite proposals only from a limited number who would most likely meet requirements within your price range. Suppliers can be prescreened by contacting those listed in the local Yellow Pages and by contacting local businessmen and industry colleagues. Suppliers of vertical-industry systems often advertise in trade publications.

Upon verifying that each supplier is willing to provide a proposal, issue the request for proposal. Be prepared to answer questions from the suppliers, but do not make firm commitments at this stage.

STEP 5 - EVALUATE PROPOSALS AND SELECT BEST

Review each proposal for completeness. If a proposal is vague or information is missing, ask the supplier questions. Suppliers can be expected to provide important information, such as firm prices, in writing.

Analyze each proposal using the evaluation criteria as the main basis for selection. Eliminate the least favorable suppliers. You may have a 'clear winner' or a shortlist of two or three suppliers.

Before making a final decision, call on the suppliers' reference customers to determine their degree of satisfaction. Also, ask for demonstrations of the systems at the suppliers' offices or other customers' sites. During the demonstrations, evaluate the systems for ease of use, quality of documentation, and compliance with the specifications of the proposal.

Continue the evaluation until the selection is narrowed down to one supplier. However, do not be rushed into a decision. Above all, if no proposed system meets the original objectives be prepared to extend the search to other potential suppliers or to discontinue the project.

STEP 6 - SUPPLIER NEGOTIATION

This is the final step of the selection plan and is concerned with ensuring that no points remain outstanding before making a final commitment to the selected supplier. The following questions should be asked:

- Have all areas of the specification been answered satisfactorily?
- Have all maximum costs been identified and firmly fixed in a written response?
- Has a schedule for the implementation of both the computer hardware (if applicable) and the application software been agreed to?
- Have the responsibilities of the vendor and yourself been clearly defined?
- If acquiring computer equipment, have the advantages of both the purchase and lease of hardware been investigated?
- If formal contracts are required, has legal advice been sought to review the terms?
- If there are no contracts, have you sufficient written guarantees?

The selection process is now complete and a final decision may be made.

Chapter Six

Implementing a Computer System

IMPLEMENTATION PLAN

The main requirements for getting a computer system working are similar to those applied to the selection process. Work must be planned and controlled with sufficient time allocated for all steps.

A work plan should be prepared in conjunction with the computer system supplier. The plan should identify the sequence of events and individual work activities for the installation of hardware and each major application software system. Personnel from your staff and the supplier should be identified and assigned to each activity together with estimates of actual work time and elapsed time. Significant milestones should be identified for project reviews. The calendar schedule should include some contingencies for unanticipated problems. Explain to all staff who have not been involved in the project how the computer system will affect them.

The first point on your work plan should be "Inform your staff"! The success of computer systems is dependent on the co-operative efforts of informed staff. This is particularly true if the selected system involves custom development of application software. Although the supplier will be responsible for most of the development work, your staff may be asked to describe the details of the business procedures.

Prior to the arrival of the computer system, manual records should be organized and up-to-date. This will ease the burden of conversion and provide a good basis for verifying the correctness of the new computer system.

With the help of the computer system supplier, undertake a training program to familiarize yourself and your staff with the new system and its procedures. Obtain complete documentation on the system from the supplier. This will make training and start-up activities easier and assist in system maintenance. From the training and documentation, prepare a draft procedures manual specific to your business operations.

Order any required computer supplies such as printer ribbons, spare diskettes, magnetic tapes or computer forms. If special pre-printed forms such as invoices, cheques or continuous-form letterhead are required, the forms supplier may require several weeks for delivery.

Prepare the offices for the installation of the hardware. Office changes may be as simple as rearranging desks in preparation for a micro-computer system or data terminals for a service bureau system. Larger computers may require special electrical work, air conditioning or a separate room. The office changes should consider the effects on staff, with particular attention to lighting, noise (from printers and fans) and additional heat from the computer.

Install and test the computer system. Preliminary tests should cover all functions of the system, with attention to seldom-used functions (e.g., year-end closing). After testing with fabricated data, begin operations with the company's data and compare computer results with those produced by the manual systems. Above all, do not discontinue the manual system until everything is working correctly.

If the new computer system includes several applications systems, each should be implemented and tested one at a time. The order of implementation should follow a logical sequence, especially if the systems are integrated. A phased implementation can reinforce training and avoid confusion.

At the end of each phase, conduct a progress review. Maintain a diary of events and organiz all notes. (These notes may be needed if things go sour: a key staff member quits, the supplier fails to deliver, etc.) Be prepared to revise your plan where necessary but make sure you still have control of the project.

Revise the draft procedures manual to reflect the operational activities and control procedures required for an efficient and effective system.

Once the computer system has been installed and all start-up difficulties have been ironed out, it is wise to conduct a post-implementation review. Analyse whether the expected benefits of moving to a computer system have been fully realized and assure that proper controls are incorporated. As part of the review, consider whether possible changes may be required in the future to make the system more effective or cost-efficient.

Chapter Seven

Operating a Computer System

COMPUTER CONTROLS

A well-implemented computer system can be quite simple to manage and operate if some fundamental rules are followed. Most of these rules are common business sense; like maintaining adequate insurance coverage. Procedures and controls should be regularly reviewed.

Every system has some weaknesses but effective controls can compensate and minimize the potential for error. The basis of control is good procedures documented in a procedures manual. When procedures change, the manual should be revised. Key staff should be trained in various operating procedures; this will minimize disruptions during periods of employee holidays, sickness or turnover.

Data and program files should be safeguarded against loss. Copies of the systems and applications software should be retained as **back-ups.** On a regular basis, copies of data files should be made and kept in a safe place. It is highly recommended that at least one back-up copy of software and data should be retained at a fireproof location other than the office. A manual record of all back-up copies should be kept in a safe place.

The computer system should be safeguarded against breaches of security, whether accidental or deliberate. Access to the computer system should be restricted only to those who are authorized to use it. Confidential data, whether stored in the computer system or printed on reports, should be secured against disclosure. Controls should be established to ensure that unauthorized changes in the software cannot be made. Although it may be difficult in a small business, staff duties should be separated as much as possible. For example, the person responsible for shipping and receiving goods should not be permitted to maintain the inventory records on the computer.

The computer system should incorporate good audit trails. Visible records of all transactions which change data, whether entered manually or generated automatically, should be produced and retained in a safe place. Computer recorded transactions should be supported by source documents (copies of invoices, cancelled cheques, etc.) which should be filed in an organized manner. Periodic reviews and audits of the computer system should be conducted.

MAINTENANCE

Good computer maintenance procedures begin with prevention. A proper environment for the computer should be provided; the computer area should be kept clean and the temperature kept at a safe operating level. The electrical power supply should be maintained at a satisfactory level. If in doubt, ask a qualified computer service technician to check it out. In general, the guidelines specified in the computer operating manuals should be followed.

It is always advisable that computer maintenance services be contracted from a qualified service organization, preferably from the computer supplier. Maintenance contracts generally include preventative as well as remedial maintenance. Maintenance services beyond normal working hours often have a premium charge; additional coverage may be important if the computer system is critical to the success of your business.

Although software does not wear out or break down like hardware, you may be asked to contract for software maintenance. Software maintenance provides for corrections of errors in the programs and provision of improved versions of the software. It is advisable to contract for software maintenance for at least one year after your system is installed. If, after this "shake down" period, the software appears to be free of errors and is operating satisfactorily, you may want to consider the value of the software maintenance contract. Remember that some software, such as a payroll system, may require changes due to circumstances beyond your control.

EVOLUTION OF YOUR COMPUTER SYSTEM

A computer system must not be thought of as being unchangeable for all time. It should evolve along with the organization it serves. Anticipate the effects on the computer system caused by business changes, whether business volumes, practices or the nature of the business. If your business experiences significant business growth, you will most likely have to expand the capacity of your computer system. If you have planned well and selected the right computer system, you will be able to increase the capacity of your computer by adding memory, disk storage, data terminals or printers as required.

In some cases, you may require major changes to the computer system. You may have reached the limits of growth of the computer or require a major change of applications software. If this is the case, you should treat the major change as a new project, much like the original computer system selection project.

Appendix A

Computer Overview

INTRODUCTION

Computer systems based on microcomputers and minicomputers have the greatest appeal to small businesses. The price and capacity of these systems best match the resources and requirements of small businesses. For this reason, the following discussion focuses on business microcomputer and minicomputer systems. For our purposes, we define a microcomputer as a computer system which performs one primary task at a time and accordingly supports only one **user** at a time. A minicomputer is one which performs two or more tasks at a time and supports two or more concurrent users.

Having said that, we should note that there are microcomputers on the market which have the power and capacity to do work far in excess of some of the minicomputers. With the rapid development of electronic technology, price, performance and size definitions of computers are quickly outdated.

The modern day computer comprises two main components:

- the physical equipment (hardware)
- the logic or programs that provide the method of instructing the computer (software)

This appendix gives a general description of the various hardware and software features which form a computer system. It is intended as an introduction only and readers interested in detailed specifications should consult their local libraries.

HARDWARE

The term "hardware" is derived from the fact that you can actually "touch and feel" these physical components of a computer system.

The various pieces of computer hardware are best understood by examining their purposes. Computers have five main functional components:

- processing
- storage
- input
- output
- data transmission

The prevalent types of equipment within each of these functional categories are discussed in the following text along with an overview of their major uses and limitations.

PROCESSING

Processing is the means by which data are manipulated through arithmetic operations (e.g., calculating a percentage mark-up), logic operations (e.g., comparing alternative list prices) and rearrangement (e.g., sorting a customer list by postal code). The processing occurs under the control of operating and application system software (described later). The main hardware processing components include the following:

- Central Processing Unit (CPU)
- Main Memory

The CPU is the nerve centre of the computer system and controls the functions undertaken by the system. Modern microcomputers and minicomputers employ one or more **microprocessors** as the processing "engine" of the CPU. A microprocessor is a silicon-coated chip, approximately the size of a baby's fingernail, which contains the equivalent of several hundred thousand transistors. The power of the CPU is measured by two factors'- the speed at which it can operate, measured as instructions per second and the capacity measured as the amount of data which can be processed in one operation. Typical CPUs have capacities of **"8-bit", "16-bit"** and **"32-bit"** which can be likened to automobile engines with four, six and eight cylinders.

Complementing the CPU is the main memory. The CPU uses the main memory to store the programs and data that are being processed at that time. Memory size, which is another rating of the capacity of a computer, is measured by the number of **bytes** (equivalent to a number or a letter) of data or instructions which the memory can store. It is normally described in terms of **kilobytes** (abbreviated **K** or **Kb**) which equals 1,024 bytes of memory, for example 16K, 64K or 256K. The amount of memory required by a computer depends upon the number and sizes of programs which the computer executes at one time. A microcomputer, which executes only one program at a time, requires as much memory as the largest of the programs intended for operation on the microcomputer. Typical memory sizes of microcomputers range from 48K to 256K, although some microcomputers have the capability of expanding to 1,024K (one megabyte) and beyond. Minicomputers which operate several programs at once, thereby serving multiple concurrent users, have larger memory requirements. Typical minicomputers have memory sizes which range from 64K to several megabytes; most minicomputers (and the larger midicomputers and main frames) use special techniques to support many concurrent users while minimizing the requirements for large amounts of memory.

STORAGE

After data has been entered into the system, it is usually retained or stored in files for later access. The purpose of data storage is to maintain the data in a form that is accessible by the CPU and available for future processing.

There are two main types of data storage devices:

- magnetic disk
- magnetic tape

Magnetic disk is the most common form of storage on current equipment. It consists of a magnetic recording surface on a platter or disk, which is rotated at high speed by the disk drive. A movable arm within the drive records and retrieves data from the magnetic surface.

The popularity of magnetic disks can be attributed to the principle of direct access. (Magnetic disks are often referred to as direct access storage devices.) Direct access devices allow data to be read directly without searching through the entire file (as is required with sequential tape files). As a result, processing is easier and faster with disk devices.

The most common forms of disk devices are:

- **floppy disk** - a flexible disk or diskette with storage capacity of 250,000 to one million characters
- **hard disk** - a rigid disk with larger storage capacities (usually five million characters and up)

The floppy disk is used as primary storage on the smallest minicomputers and microcomputers. In addition, it is often the back-up medium for hard disk storage. Because of the limited storage capacity and relatively slow speed of floppy disks, many business computers use hard disks.

The hard disk also comes in a number of forms including:

- **removable disk pack or cartridge** which can be removed from the disk drive mechanism
- **fixed disk** which cannot be removed from the drive unit

With removable disks, data and files are copied to another disk for back-up. With the fixed disk, data and files are copied to diskettes or magnetic tape for back-up. Fixed disk drives are generally more reliable than their removable counterparts, since the units are sealed against airborn contaminents

Magnetic tape exists in three main forms:

- reel-to-reel
- tape cartridge
- tape cassette

The reel-to-reel tape has data storage capacity often exceeding 150 million characters and is primarily used with large systems for data back-up or for large volume infrequently used files.

The tape cartridge is physically smaller than the reel-to-reel and has storage capacity of up to 60 million characters. It is also used for back-up and historical files and is available on microcomputer and minicomputer systems.

The magnetic tape cassette is much smaller in size, speed and capacity and is only used with the smallest microcomputers as file storage. It is similar in appearance to the hi-fi cassette tapes used in many home stereo systems but the tape is normally of higher quality. Cassette storage capacities range from around 250,000 to 500,000 characters.

The main advantages in the use of magnetic tape are:

- removable (from the computer)
- transportable
- inexpensive
- easy to store

Data are stored on magnetic tape in a sequential order. When particular information is required all preceding information on the tape must be read first. Accordingly, the time to access the data are relatively slow by computer standards. As mentioned earlier, magnetic tape is used primarily for back-up and retention of historical files.

Data storage devices which combine fixed hard disks and tape cartridge drives are commonly used for microcomputers and minicomputers. Such combination devices have the advantages of convenience, speed and simplicity of operation for such daily tasks as preparing data back-ups.

INPUT

The first step in the data processing cycle is input. This involves the entering of data into the system. There are two basic methods of data entry:

- on-line data entry
- off-line data entry

On-line data entry is the approach that is most often used in small business computers. It is accomplished through the use of data terminals that are connected on-line to a minicomputer or, in the case of a microcomputer, a keyboard which is attached to the CPU. The most common on-line data entry device is the display terminal. This TV-like device, equipped with a keyboard similar to a typewriter, is referred to by various names including:

- CRT (cathode ray tube)
- VDT (video display terminal)
- display screen

Another on-line data entry device used with some small business systems is the printer terminal. It consists of a keyboard and built-in printer.

On-line data entry has the main advantage of providing immediate validation of data as it is entered into the computer.

Off-line data entry, as its name suggests, is done independently or "off-line" from the computer. Data are keyed from source documents (or data coding forms) using special "key-entry" machines which record data on media such as punch cards or diskettes. Batches of data may be input to a computer at a later time.

Off-line data entry is typically used by large companies to handle heavy volumes of data without tying up the resources of the computer. It is also commonly used by service bureaus to provide many customers with a central data entry facility. Small businesses sometimes use off-line data entry services to convert manual records to computer form during the implementation of a new computer system.

Some small businesses may have requirements for specialized input devices. For example, electronic cash registers and bar-code readers, used in the retail trade, can serve as input devices for a small business computer.

OUTPUT

As with most machines, the primary function of a computer is to produce a specific result (output). In a computerized payroll system, for example, one form of output produced by the system is an employee cheque.

There are three basic kinds of output from a computer system:

- printed output
- display output
- machine readable output

Printed output is one of the most common forms of computer output and might include items such as invoices, payroll cheques, printed reports or T4 slips.

The four main types of printing devices are:

- page printers (up to 20,000 lines of print per minute)
- line printers (from 100-1,500 lines per minute)
- character printers (30-180 lines per minute)
- special printers such as graphic plotters

Page printers use a process similar to dry photocopiers, but their costs are from two to three times greater than photocopiers of equivalent capacity. Generally, only larger businesses use page printers.

Small businesses without large printing requirements will normally use a character printer but there may be special circumstances where faster and more costly line printers are required.

Specialized printing devices such as graphic plotters or bar-code ticket printers are available for special requirements.

Video display output is commonly used in data processing systems and consists of displaying information on a video screen. Microcomputers usually provide video output on a display screen which is directly attached to the CPU. Minicomputers use video terminals which combine a keyboard and the screen in one unit; several video terminals may be connected to a minicomputer.

The main advantage of using displayed output is quicker access to information. Displayed output cannot, however, replace printed reports where hardcopy records are required for legal, audit or control purposes.

The most common forms of machine readable output are magnetic disk and magnetic tape. Disks and tapes are most often used for storage of data which is to be input to the computer at a later time. Data can be transferred from one computer to another using disks or tapes. Another example of computer readable output is printed bar-codes on price tags,

which may be input to a computer (or electronic cash register) using bar-code readers.

DATA TRANSMISSION

Data transmission or data communication refers to the transfer of data from one hardware component to another. Typical data transfers include:

- communication to and from local or remote terminals
- between computers

Local terminals, usually within 1,000 feet of the computer, are connected via cable and can transmit at high speeds (600 to 12,000 characters per second).

Remote terminals are connected via telephone lines and may transmit at speeds ranging from 25 to 1,200 characters per second. Alternative means of telecommunication include the following:

- dial-up
- shared facility (Datapac, Infoswitch)
- private lines

Dial-up is most economical in cases of irregular and infrequent use of data communications. The private line is the most costly communications service and is normally used where high volume situations justify the costs.

In addition to telephone line charges, there are charges for devices used to send and receive signals over the lines. These devices, called **modems,** convert the computer signals to a form which may be transmitted over telephone lines.

Communication between computers is becoming more common. Many businesses use their in-house computers to communicate with service bureaus for specialized services (e.g., payroll preparation, commodity price retrieval or transfer of data for production of microfilm).

Small businesses which have significant needs for data communications should review their requirements with specialists from the telecommunications suppliers. In Alberta these are Altel Data, CN/CP and 'edmonton telephones'.

SOFTWARE

Software refers to the instructions which tell the computer what to do. There are two kinds of software:

- operating or systems software
- applications software

The operating system software is often provided by the computer manufacturer and consists of a number of components. The operating system handles the logistic functions of the computer system and co-ordinates or orchestrates the interactions between the various hardware components. For example, it ensures that data entered through a terminal is routed to main storage for processing and is not lost or changed along the way. Other systems software includes:

- **Program compilers:** Used to translate the program instructions into the machine readable language that the computer can understand. Common program compilers for small business computers include COBOL, RPG, and BASIC.
- **System utilities:** Handle routine tasks such as sorting data, copying files from one disk to another and merging two files together. They save the computer user from having to develop programs to handle these functions.

- **Data base handlers:** Special utilities which allow sophisticated data handling techniques to be used in organizing and maintaining files.
- **Communications software:** Programs dedicated to handling the transfer of data between the computer and local or remote terminals.

The user of a small business computer does not normally require an in-depth knowledge of the computer's operating system. However, knowledge of the functions and procedures for using operating and application software is important.

Application software refers to programs that make the computer system work for a particular task. Examples include general ledger, payroll and inventory control.

The main kinds of application software include:

- **Custom developed programs** specifically written for an individual business user
- **Package applications** written to fit the requirements of a particular business function (e.g., accounts receivable). Due to their general nature, packages may require changes to meet the special needs of a user. Most small businesses find it effective to select packages which best fit their business needs and to adjust their business practices to accommodate any differences in procedures.
- **Functional applications packages** written to fit the general requirements of business functions. Some of the popular functional applications packages include electronic spreadsheet, business graphics, word processing and data base software. These packages can be used for a variety of purposes within small businesses.

Application software is usually obtained from one of the following sources:

- equipment manufacturer or service bureau
- software houses which specialize in the developing of custom or packaged applications
- computer retail stores which specialize in providing small business computer systems
- in-house development where the development work is undertaken by the computer user

Few small businesses choose to develop applications software; because of the technical knowledge required and time delays, this approach is generally the most expensive source of applications software.

The costs of application software vary depending upon the application and the supplier. A general ledger package for a small business computer could cost from $300 to $3,000. In some cases, the system is only available on a monthly rental basis. Costs for custom developed application software usually start around $1,000 and are usually significantly more expensive than packaged software costs.

Appendix B

Sample Request for Proposal

XYZ Construction Co. Ltd.

Request for Proposal to Provide a Construction Management Computer System

REQUIREMENTS

XYZ Construction Company is a general contractor specializing in building additions and renovating schools and public buildings. A wholly-owned subsidiary, XYZ Brickworkers Ltd. provides most of our masonry subcontracted work. Our head office and maintenance facilities are located in Morinville, Alberta. Both companies share the same offices.

Due to increasing competitiveness in the construction industry, we are considering the installation of a computer system to assist in accounting, payroll, job estimating and job costing.

On the following pages, we have outlined our requirements for equipment and services. Please provide a formal response to the undersigned no later than October 31, 198X.

X. Y. Zed
President
XYZ Construction Co. Ltd.
Box 12345
Morinville, Alberta T0A 0C0

INTRODUCTION AND BACKGROUND

The successful supplier is expected to provide software capable of processing the following applications. **Note that all software is expected to handle two separate companies.** Anticipated data volumes are provided. Monthly volumes are stated as maximums in the busy season.

a. **General Ledger**

To maintain the financial records of the two companies.
To produce monthly financial statements, including profit and loss statements by profit centre.
To provide a good audit trail.
Volumes:
Accounts 200, growing to 250.
Profit centres, up to five per company.
Transactions 300 per month, growing to 500.

b. **Accounts Receivables**

To maintain open-item accounts receivables balances.
To maintain and retrieve individual accounts balances.
To produce monthly statements which clearly identify trade receivables and holdback receivables.
To report on overdue accounts.
To provide linkage to the general ledger for summary journals.
Accounts 20, growing to 30.
Transactions 50 per month, growing to 75.

c. **Accounts Payables**

To maintain accounts payables balances, including holdback accounts.
To maintain suppliers' records.
To prepare cash requirements, cheque register, cheques, payables transaction register and aged accounts payable reports.
To reconcile cancelled cheques.
To provide linkage to the general ledger for summary journals and job costing for details.

Volumes:
Suppliers 250, growing to 400.
Transactions 300 per month growing to 500.

d. **Payroll**

To maintain payroll accounts.
To maintain hourly-paid and salaried employee records.
To produce payroll from weekly time records.
To prepare payroll reports (register, deductions, distribution, UIC.
Separation Certificates, Statistics Canada, Workers' Compensation, etc.).
Co reconcile cancelled payroll cheques.
To provide linkage to the general ledger for summary journals and job costing for details.
Volumes:
Salaried employees 10, growing to 15.
Hourly-paid employees 100, growing to 150.
Bi-weekly payroll for hourly-paid; monthly payroll for salaried.

e. **Job Estimating**

To prepare construction job estimates for general contracts.
To maintain standard costs of materials, labor, equipment and burden.
To prepare job estimate reports in summary and detail, by phase and by job component.
To provide linkage to job costing for detailed job budgets.
Volumes:
Job estimates 30 per year, growing to 50.
Materials components 500, growing to 750.
Labor classes 25, growing to 40.
Equipment classes 50, growing to 75.
Burden factors 25, growing to 35.
Detail elements per job estimate 500.
Job phases per job 25.

f. **Job Costing**

To maintain construction job costs, tracking labor, materials, equipment and burden.
To track construction work-in-progress and work-completion reports for billing relief.
To report job costs, detailed units analyses and detailed job transactions.
To provide linkage with general ledger for summary journals.
Volumes:
Concurrent jobs six, growing to 12 (refer to volumes in Job Estimating,
Payroll, Accounts Payables for other volumes).
The following applications are desirable:

g. **Word Processing**

To enhance stenographic activities in the preparation of normal correspondence and form letters.
To access data from other files (e.g., vendors' names and addresses from Accounts Payables files).
Volumes:
Normal correspondence, 60 letters per month.
Form letters, 200 letters per month.

h. **Electronic Spreadsheet**

To assist in the preparation of models and analyses, such as budgets and long-term financial plans.
Volumes:
Spreadsheet preparation 10 per month.

RESPONSE GUIDELINES

Computer system suppliers are requested to provide written responses and generally conform to the following guidelines:

- Equipment specifications of proposed system:
  - Identify and describe each piece of equipment in terms of capacity,performance, physical size, electrical requirements and environmental requirements.
  - Identify the expansion features of the proposed system and themanner by which the capacity is expanded.
- Software specifications of proposed system:
  - Identify and describe each applications software package in terms of functions.
  - Identify and describe all operating and system support software.
- Equipment maintenance:
  - Identify and describe the hardware maintenance and support plan(s).
- Software maintenance:
  - Identify and describe the software support plan(s).
- Training and installation:
  - Identify and describe all training programs, in particular, any training which may be conducted at our offices.
  - Identify and describe installation support plans for both hardware and applications software.
- Cost and financing:
  - Identify all costs for proposed hardware and expansion features, applications and systems software, hardware and software support plans, delivery, installation and training.
  - Identify alternative financing plans, if available.
- Warranties and agreements:
  - Include copies of your standard equipment purchase, software license and hardware/software support agreements.
  - Include copies of standard warranties.

TERMS AND CONDITIONS

- Written responses must be received by XYZ Construction Co. Ltd. by October '31, 198X.
- All information provided by XYZ Construction Co. Ltd. must be kept confidential.
- All materials received by XYZ Construction Co. Ltd. will become the property of XYZ Construction Co. Ltd.
- All prices quoted by the computer suppliers must be valid for a period of 90 days.
- Suppliers must identify three reference accounts which use the same or similar computer system as proposed. At least one reference account must be located in Alberta.

XYZ CONSTRUCTION COMPANY October 1, 198

Appendix C

GLOSSARY OF TERMS

APPLICATIONS SOFTWARE - a program, or set of programs, designed to perform a particular application, or task (as in information retrieval, word processing, data analysis).

AUXILIARY MEMORY - computer storage which is external to the computer itself, e.g. magnetic disk, magnetic tape.

BACK-UP - a copy or copies of computer information made in anticipation of a computer failure.

BACK-UP/RESTORE - procedures or facilities which allows a user to retain information in the event of a computer failure, and recover from the computer failure.

BASIC (BEGINNER'S ALL-PURPOSE SYMBOLIC INSTRUCTION CODE) - a high level programming language designed for ease of use. It is now a standard programming language, in a number of variant forms, for microcomputers.

BIT - an abbreviation for binary digit. It represents the smallest unit of information (corresponding to, e.g. 0 or 1; 'on' or 'off'; 'signal' or 'no signal'). Computers usually store information as a series of bits. (See also byte).

BYTE - a group of adjacent bits, such as 4, 6 or 8 bits, operating as a unit. For example, an eight bit byte may be used to specify a letter of the alphabet, an instruction or an address. Unless otherwise indicated, a byte is normally assumed to be 8 bits long.

CARTRIDGE - a case containing a magnetic tape or magnetic disk which may be inserted in a tape drive or disk drive respectively.

CENTRAL PROCESSING UNIT (CPU) - the heart of a computer. It contains the arithmetic and logic unit, the core memory (see memory) and the control unit, which directs and coordinates the operation of the computer and its peripheral units. It thus carries out all the arithmetic, logic and control operations.

COMPUTER SERVICE BUREAU - a facility, usually commercial, which allows a computer user to lease time on a central processor and appropriate peripherals to run his/her programs.

COMMUNICATIONS SOFTWARE - computer programs designed to transmit and receive data using telecommunications facilities such as the telephone system.

CURSOR - a light indicator on a display screen, which shows where the next character is to be generated. The cursor can be moved across the screen by use of a key on the keyboard.

DATABASE - a store of data on files which can be made accessible to a computer, often used in connection with an information retrieval system.

DATABASE HANDLER - software which permits the use and monitoring of a database. For example, a check can be kept on who uses the database (security), and the level of usage. Database handlers permit easy updates and retrievals of information to/form databases.

DISK - a form of backing storage. It consists of circular plates with magnetizable surfaces which possess a number of recording tracks, divided into sectors. Each track and sector is addressable, which gives disk storage its random-access capability. Several read/write heads access data on each surface, each head covering a particular area. This provides direct access to data with access times of the order of 20-100 thousandths of a second.

FEASIBILITY STUDY - an examination of a function which determines the technical and financial implications of changing the function in order to improve it.

FILE - refers, in general, to any organized and structured collection of information. The data in such a collection are organized into items, and structured so as to facilitate the type of access required.

FIXED DISK - a disk memory in which the recording surfaces remain permanently within the drive unit.

FLOPPY DISK - a disk made of a flexible material, e.g. plastic, coated with a magnetic surface. Such disks are relatively cheap to make and easy to handle, but they have more restricted storage than a hard disk.

HARD DISK - a magnetic disk with rigid plates, used for bulk storage of computer data. Hard disks offer much larger storage capacities than floppy disks and data transfers are much faster.

HARDWARE - the mechanical, magnetic, electronic and electrical devices which go to make up a computer.

INPUT DEVICE - any item of equipment which permits data and instructions to be entered into a computer's central memory, e.g. keyboards, terminals and light pens.

INTERFACE - used as a general term to describe the connecting links between two systems. The term most frequently refers to the hardware and software required to couple together two processing elements in a computer system.

K - an abbreviation for kilo, denoting a thousand (10y3). When referring to computer storage capacity, K is generally used to mean 1,024 (2y1y0). For example, a 64K byte store actually contains 65,536.

KB - Kilobyte or 1,024 bytes.

LANGUAGE COMPILER - software programs which translate a high level language into a sequence of machine language instructions for the computer.

MAINFRAME - any large computer, distinguishing it from a minicomputer or microcomputer.

MANUAL PROCEDURES - documented activity steps which are required to be performed in order to manage, control and operate a function.

MEMORY - a device into which information can be introduced and stored for extraction by a computer when required. Central memory is the memory within the central processing unit. Auxiliary memory devices include magnetic disk and tape.

MICROCOMPUTER - a small (desk top) computer which uses a microprocessor as its processing element.

MICROPROCESSOR - a central processor in which all the elements are contained on a single chip. It is often used as a synonym for microcomputer.

MINICOMPUTER - a computer of intermediate size and computing power, between a mainframe and a microcomputer.

MODEM - an abbreviation of modulator-demodulator. A device for converting a digital signal (generated, for example, by a computer) into an analogue signal by modulation. In this form, the signal can be transmitted along a standard telephone line. The received signal can be reconverted from analogue to digital by the same device.

ORIGINAL EQUIPMENT MANUFACTURER (OEM) - a term used when procuring compatible equipment for an existing computer system.

OPERATING SYSTEM - software contained in a computer which allows it to control the sequencing and processing of programs, and so respond correctly to user requests, e.g. to store a file of data, to compile and run a program.

OUTPUT DEVICE - any device capable of receiving information from a central processor. It may be some form of backing storage, or a peripheral unit which translates information into another medium, e.g. a line printer or display screen.

PERIPHERAL - a device under the control of a central processor. It may mean an input device, an output device, or a storage device.

PROCESSOR - the arithmetic/logic and control unit which directs, coordinates and executes fundamental operations of a computer.

PROGRAM - an ordered list of instructions directing a computer to carry out a desired sequence of operations. The objective is normally the solution of a problem.

PROGRAM COMPILER - a software utility which translates a high level language into a sequence of machine language instructions for the computer.

PROGRAMMED - a computer is programmed by loading a set of instructions in its memory.

PROGRAMMER - a person who writes programs.

REMOVABLE DISK PACK - a magnetic disk which may be removed from the disk drive unit, thus permitting quick replacement of large amounts of data available to the computer.

SOFTWARE - the instructions, programs, or suite of programs which are used to direct the operations of a computer, or other hardware.

SOFTWARE HOUSE - a commercial organization which specializes in writing software (computer programs) for clients.

SYSTEM -an organized set of components (human beings, equipment, software etc.) which interact in a regulated fashion.

SYSTEM BUILDER - a commercial organization which specializes in combining required software, hardware and procedures for clients.

SYSTEM HOUSE - see system builder.

SYSTEM SOFTWARE -a general term covering operating systems and system utilities.

SYSTEM UTILITIES - a set of programs used to perform common functions which support computer operations. Examples include back-up/restore programs, disk formatting programs and file copy programs.

SYSTEMS ANALYST - a person who analyzes systems, and determines the scope for improved efficiency through the introduction of computers and new information technology.

TAPE - a form of backing storage, consisting of reels of plastic tape coated with a magnetic oxide. Data are entered and accessed by means of read/write heads past which the tape is wound from one reel to another.

TEXT EDITOR - software for computer editing and subsequent production of textual material. It is often used as a synonym for word processing and for text management (including systems for storing and retrieving text). The distinction in usage from word processing lies primarily in the amount of data handled: working with very large quantities of text is usually referred to as 'text handling'.

TURNKEY PACKAGE - a complete computerized system installed by a single supplier, who takes total responsibility for the production, installation and operation of all the hardware and software. 2 - a system in which the user does not need to know any programming or operating system commands, e.g. loading programs. When turned on, the system goes into a preprogrammed activity, e.g. word processing or information retrieval.

USER - a person who operates a computer for direct benefit or one who receives processed information from a computer.

UTILITY SOFTWARE - see system utilities.

VALUE ADDED REMARKETER - a commercial organization which combines software with purchased hardware and subsequently sells and supports the package.

WORD PROCESSOR - a system which provides advanced text editing functions, capable of storing and managing large volumes of text, applying changes and preparing printed documents.

NOTES

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